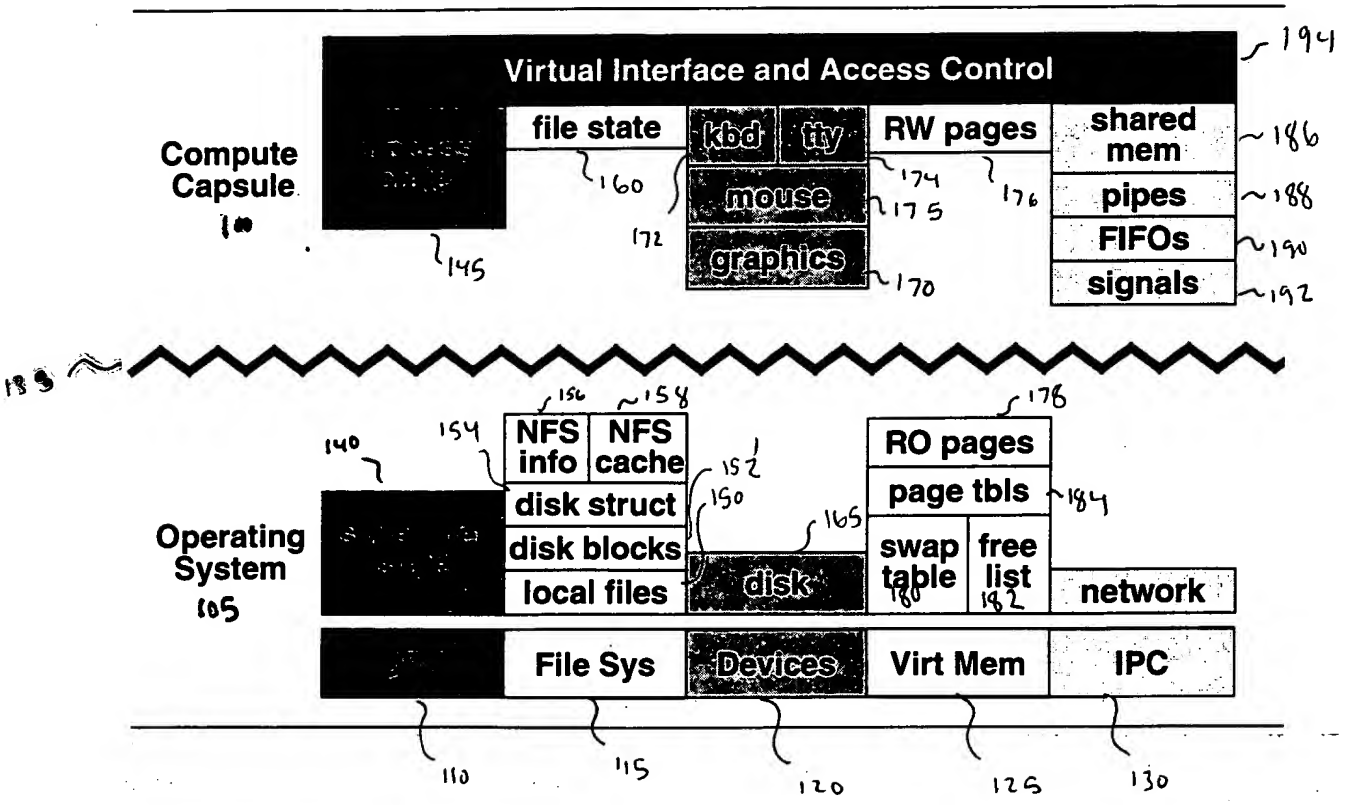
Figure 1


Virtual Interface and Access Control
194
Compute Capsule
file state
kbd
tty
RW pages
shared mem
186
160
174
176
mouse
175
pipes
188
172
FIFOs
190
graphics
170
signals
192
145
189
156
158
178
NFS info
NFS cache
RO pages
140
154
152
page tbls
184
disk struct
150
165
Operating System
disk blocks
swap table
free list
network
local files
disk
180
182
File Sys
Devices
Virt Mem
IPC
110
115
120
125
130

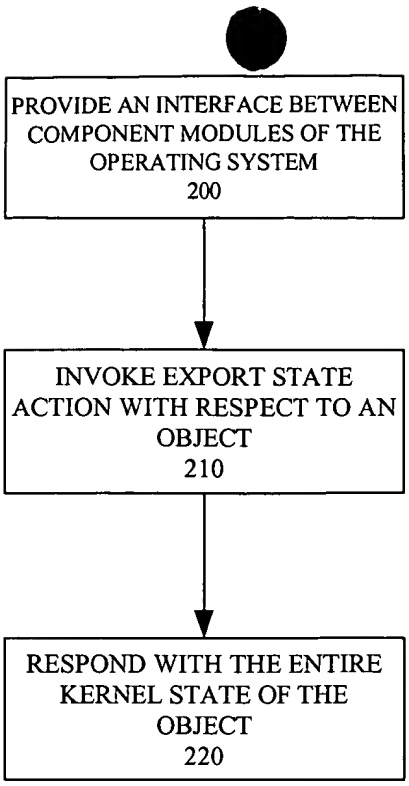

PROVIDE AN INTERFACE BETWEEN COMPONENT MODULES OF THE OPERATING SYSTEM
200
INVOKE EXPORT STATE ACTION WITH RESPECT TO AN OBJECT
210
RESPOND WITH THE ENTIRE KERNEL STATE OF THE OBJECT
220

FIGURE 2

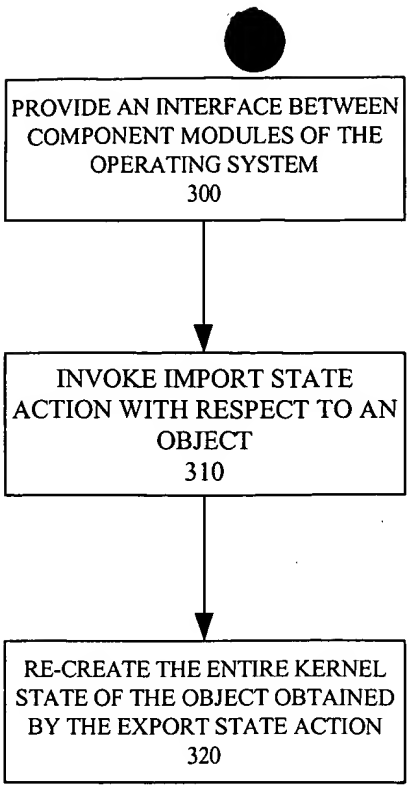

PROVIDE AN INTERFACE BETWEEN COMPONENT MODULES OF THE OPERATING SYSTEM
300
INVOKE IMPORT STATE ACTION WITH RESPECT TO AN OBJECT
310
RE-CREATE THE ENTIRE KERNEL STATE OF THE OBJECT OBTAINED BY THE EXPORT STATE ACTION
320

FIGURE 3

FIGURE 4

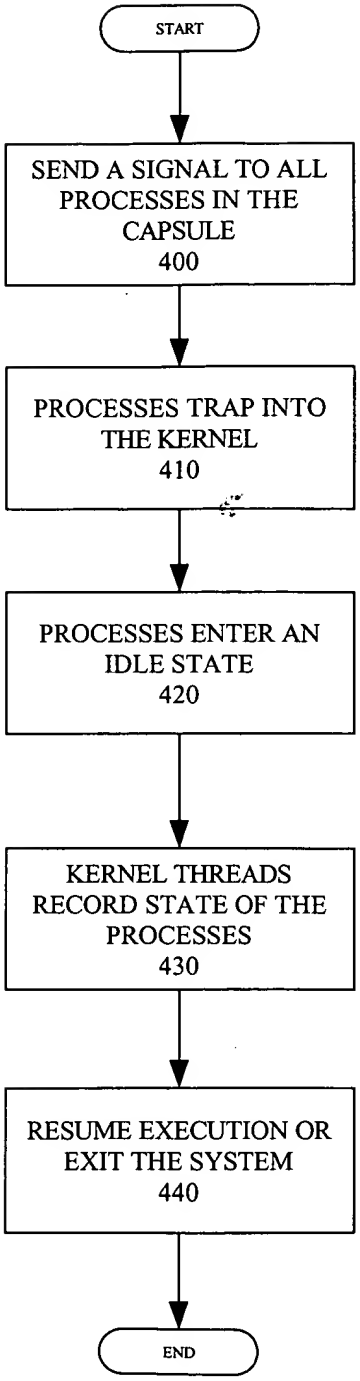
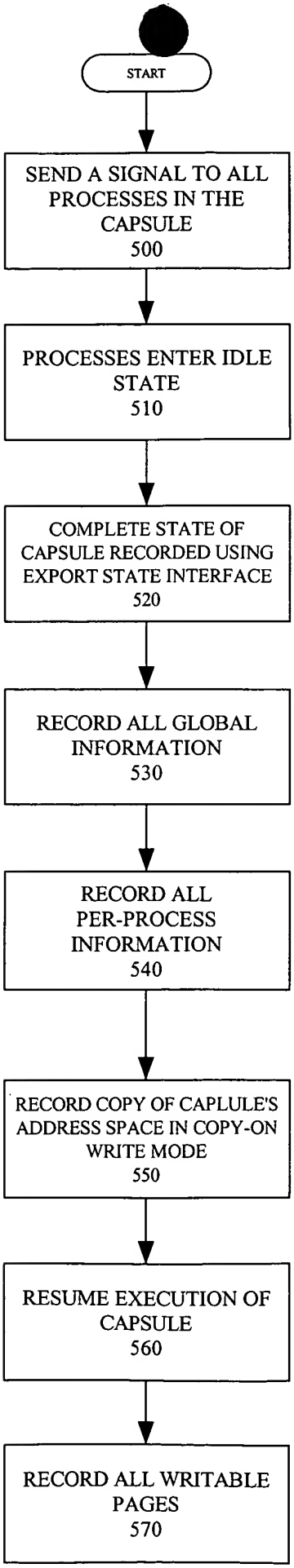

START
SEND A SIGNAL TO ALL PROCESSES IN THE CAPSULE
400
PROCESSES TRAP INTO THE KERNEL
410
PROCESSES ENTER AN IDLE STATE
420
KERNEL THREADS RECORD STATE OF THE PROCESSES
430
RESUME EXECUTION OR EXIT THE SYSTEM
440
END

FIGURE 5


START
SEND A SIGNAL TO ALL PROCESSES IN THE CAPSULE
500
PROCESSES ENTER IDLE STATE
510
COMPLETE STATE OF CAPSULE RECORDED USING EXPORT STATE INTERFACE
520
RECORD ALL GLOBAL INFORMATION
530
RECORD ALL PER-PROCESS INFORMATION
540
RECORD COPY OF CAPLULE'S ADDRESS SPACE IN COPY-ON WRITE MODE
550
RESUME EXECUTION OF CAPSULE
560
RECORD ALL WRITABLE PAGES
570

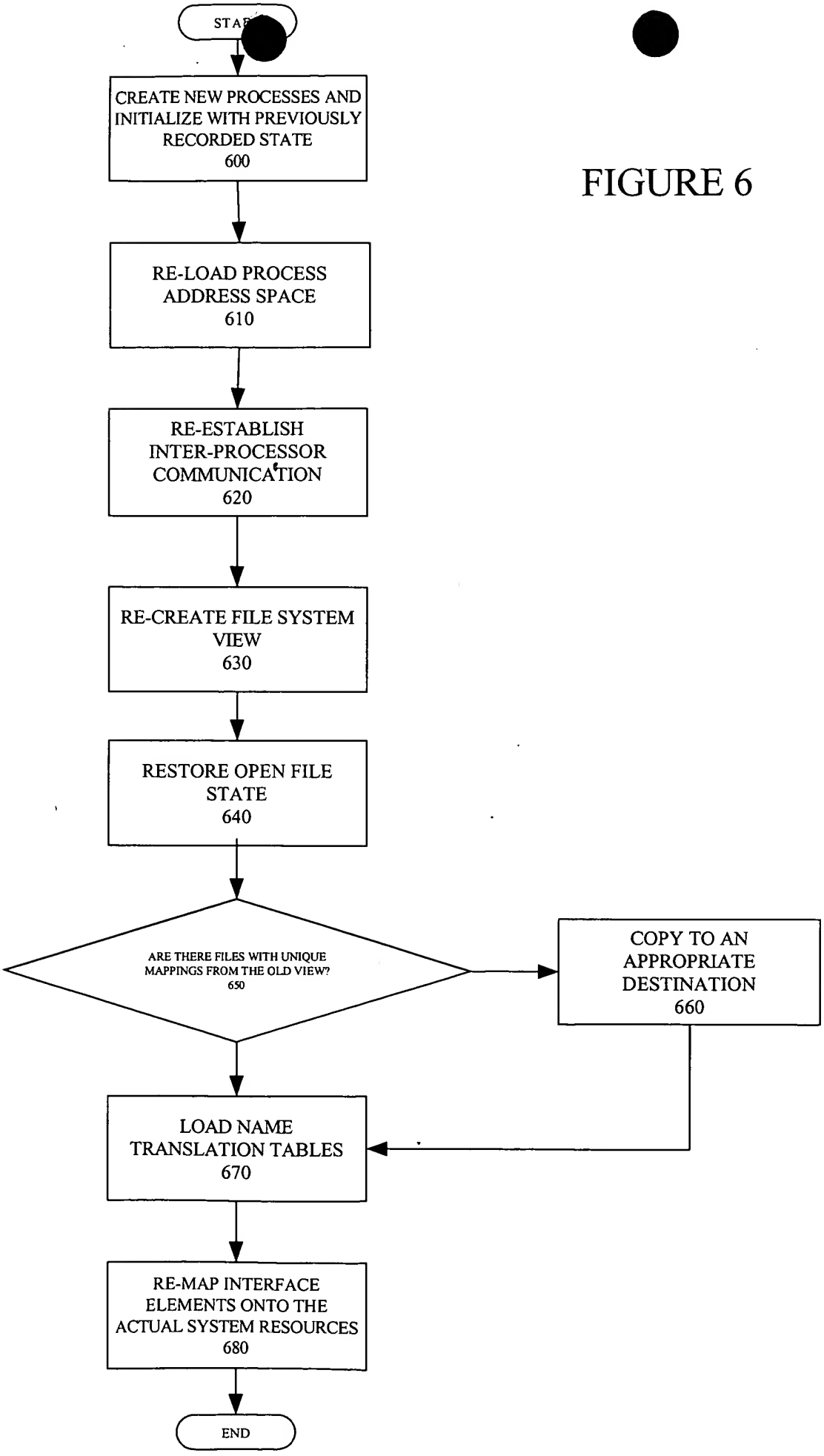

START
CREATE NEW PROCESSES AND INITIALIZE WITH PREVIOUSLY RECORDED STATE
600
RE-LOAD PROCESS ADDRESS SPACE
610
RE-ESTABLISH INTER-PROCESSOR COMMUNICATION
620
RE-CREATE FILE SYSTEM VIEW
630
RESTORE OPEN FILE STATE
640
ARE THERE FILES WITH UNIQUE MAPPINGS FROM THE OLD VIEW?
650
COPY TO AN APPROPRIATE DESTINATION
660
LOAD NAME TRANSLATION TABLES
670
RE-MAP INTERFACE ELEMENTS ONTO THE ACTUAL SYSTEM RESOURCES
680
END

FIGURE 6

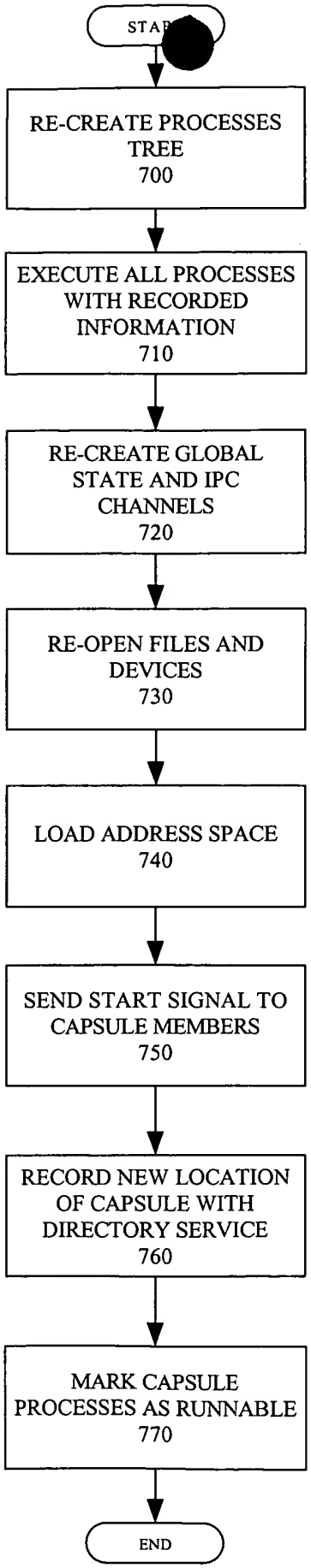

START
RE-CREATE PROCESSES TREE
700
EXECUTE ALL PROCESSES WITH RECORDED INFORMATION
710
RE-CREATE GLOBAL STATE AND IPC CHANNELS
720
RE-OPEN FILES AND DEVICES
730
LOAD ADDRESS SPACE
740
SEND START SIGNAL TO CAPSULE MEMBERS
750
RECORD NEW LOCATION OF CAPSULE WITH DIRECTORY SERVICE
760
MARK CAPSULE PROCESSES AS RUNNABLE
770
END

FIGURE 7

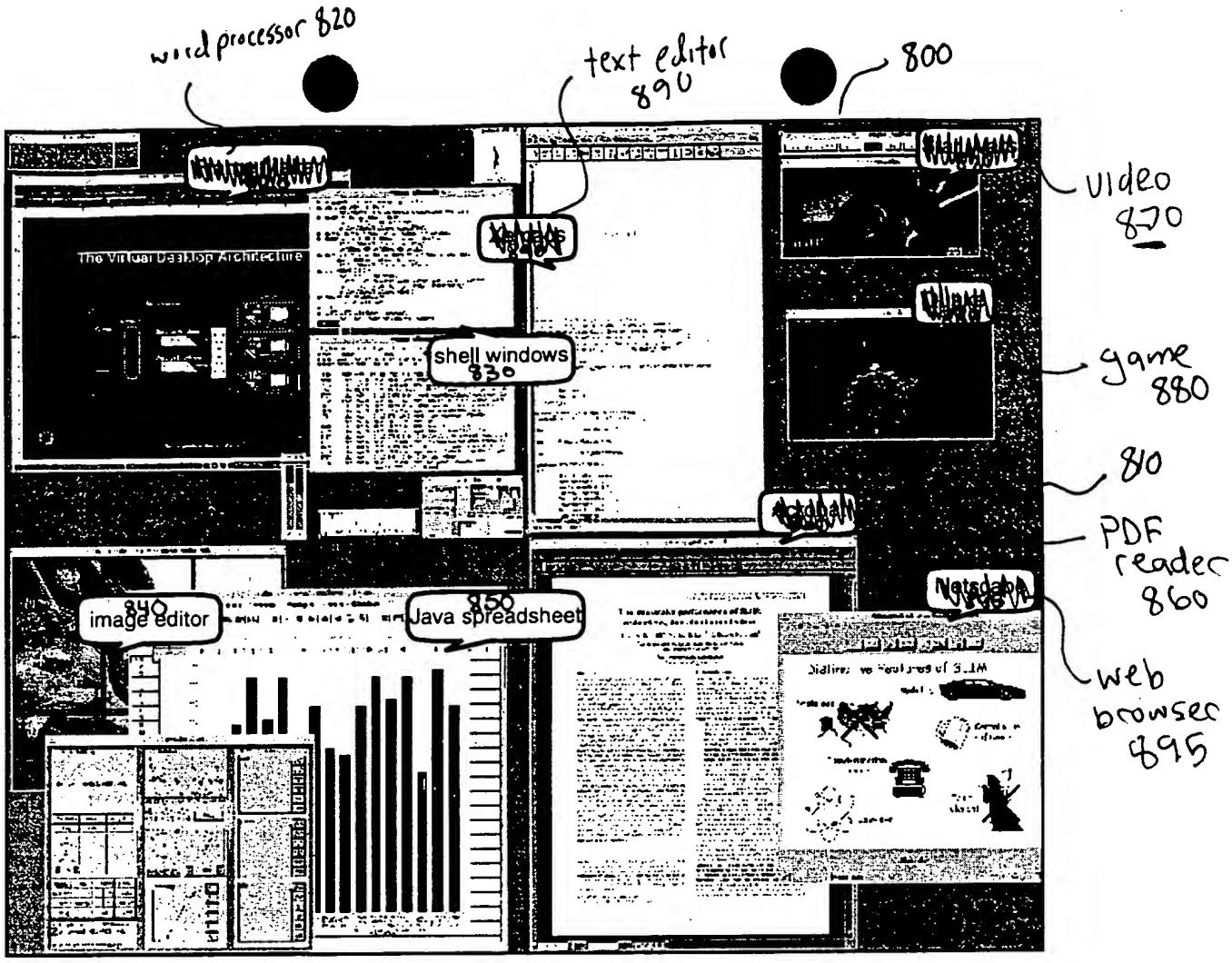

word processor 820
text editor 890
800
video 870
game 880
840
PDF reader 860
web browser 895
The Virtual Desktop Architecture
shell windows 830
image editor
850
Java spreadsheet

Figure 8

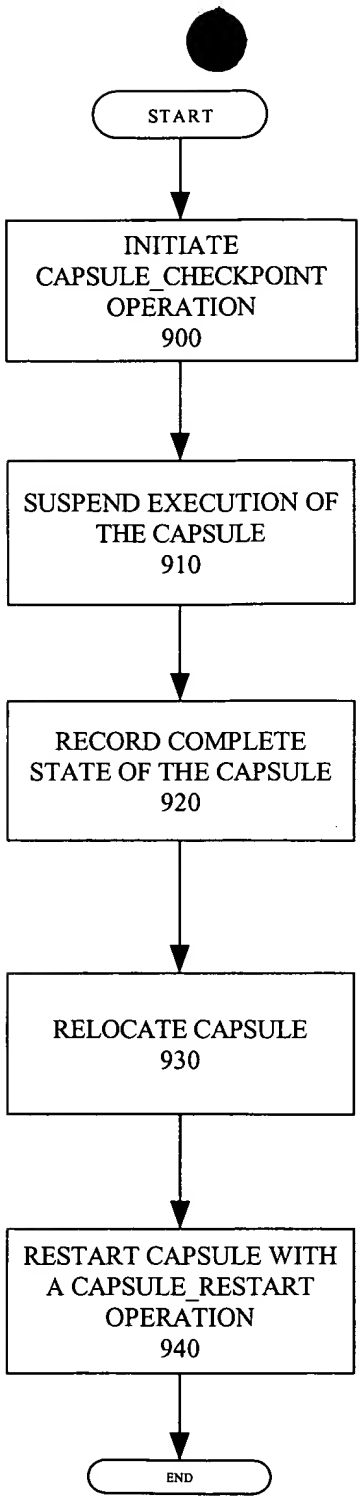

START
INITIATE CAPSULE_CHECKPOINT OPERATION 900
SUSPEND EXECUTION OF THE CAPSULE 910
RECORD COMPLETE STATE OF THE CAPSULE 920
RELOCATE CAPSULE 930
RESTART CAPSULE WITH A CAPSULE_RESTART OPERATION 940
END

FIGURE 9

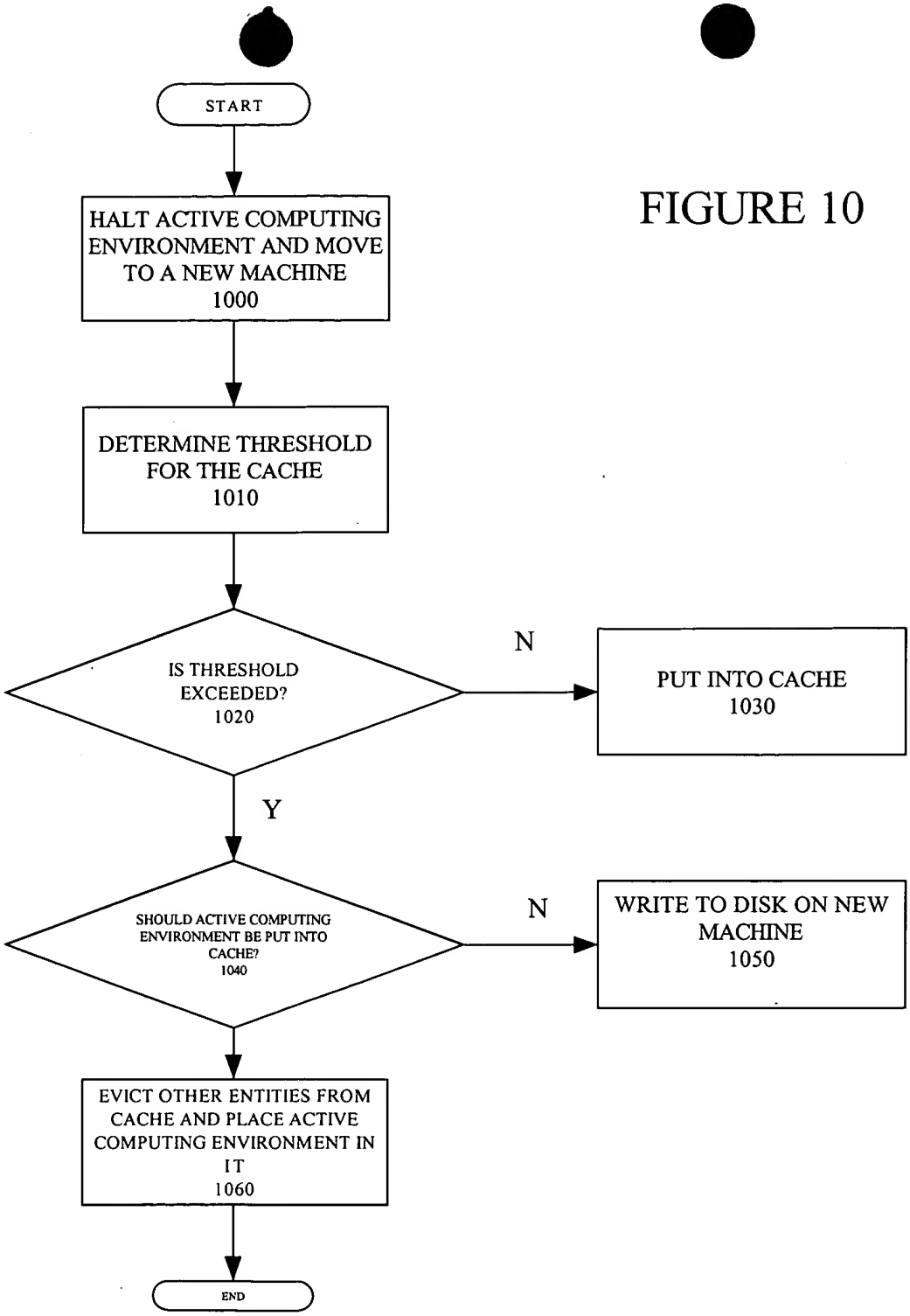

START
HALT ACTIVE COMPUTING ENVIRONMENT AND MOVE TO A NEW MACHINE
1000
DETERMINE THRESHOLD FOR THE CACHE
1010
IS THRESHOLD EXCEEDED?
1020
N
PUT INTO CACHE
1030
Y
SHOULD ACTIVE COMPUTING ENVIRONMENT BE PUT INTO CACHE?
1040
N
WRITE TO DISK ON NEW MACHINE
1050
EVICT OTHER ENTITIES FROM CACHE AND PLACE ACTIVE COMPUTING ENVIRONMENT IN IT
1060
END

FIGURE 10

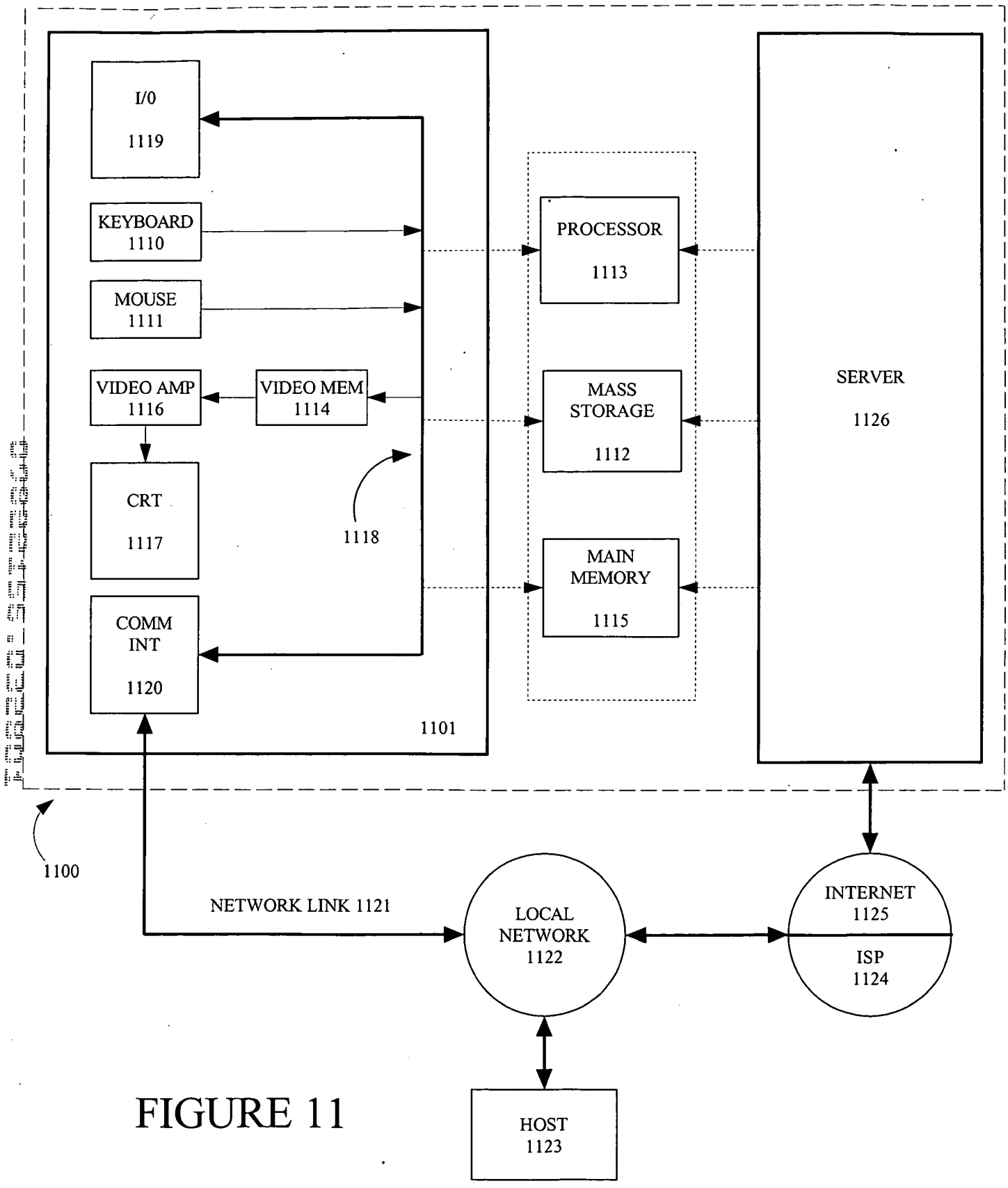

I/O
1119
KEYBOARD
1110
MOUSE
1111
VIDEO AMP
1116
VIDEO MEM
1114
CRT
1117
1118
COMM
INT
1120
1101
PROCESSOR
1113
MASS
STORAGE
1112
MAIN
MEMORY
1115
SERVER
1126
1100
NETWORK LINK 1121
LOCAL
NETWORK
1122
INTERNET
1125
ISP
1124
HOST
1123

FIGURE 11